



# Characterization of the aquatic macroinvertebrate community of Ullal de Baldoví (Sueca, Valencia, Spain)



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## INTRODUCTION

With the present work we aim at characterising the aquatic macroinvertebrate community of an oligohaline spring pool, called "Ullal de Baldoví", located on a coastal wetland Natural Park of the Eastern Iberian Peninsula. Our objective is to evaluate the status of its macroinvertebrate community just after an environmental restoration project was undertaken in order to ameliorate the degraded conditions of this ecosystem embedded in a rice field landscape highly impacted by men.

## METHODS

We sampled seasonally during 2007 the system called "Ullal de Baldoví" (Fig. 1) in order to take into account variations in the aquatic macroinvertebrate community due to life cycle effects. We selected 6 sampling points (Ba01 - Ba06) to account for the widest variability possible in the environmental traits of this system. At each sampling point and every season it was sampled, we measured several environmental variables (temperature, pH, conductivity, oxygen, chloride, and alkalinity) and collected macroinvertebrate samples using a 250 µm mesh size hand net. Some points were dry at particular periods, consequently the final number of samples collected was 21. Invertebrates collected were determined to species level whenever possible

## RESULTS

### Environmental data

The mean values of measured environmental variables are shown in Table 1. In general, the water chemistry is not highly variable among sites. Mean conductivity varies less than 200 µS/cm for a given point, with minimum values registered in Ba01 (the water source) and maxima in Ba03. Oxygen saturation percentage is lower on average in the water source (60%) and higher (around 100%) in marginal areas (Ba04, Ba05). This is most probably due to the fact that this newly restored habitats are shallower, suffer higher temperatures due to insolation and phytoplankton and phylamentous algae proliferate when conditions are adequate



Figure 1: General view (left) of the Albufera Natural Park on the Eastern coast of Spain and location of sampling points on an aerial picture of the "Ullal de Baldoví" system (right)

Station	Name	EC µS/cm	Salinity g/l	O <sub>2</sub> mg/l	O <sub>2</sub> %	Temp C	pH	Chloride mg/l	Alkalinity mmol/l
Ba01	Nacimiento	3284	1,75	5,68	60,5	19,2	7,05	1369	4,80
Ba02	Canal	3403	1,78	6,73	70,8	18,8	7,14	1380	4,84
Ba03	Carrizal	3485	1,85	5,53	58,5	18,8	7,04	1397	5,31
Ba04	Caseta aves	3453	1,80	8,58	90,0	18,3	7,25	1421	4,91
Ba05	Plataforma	3461	1,83	9,60	100,3	17,9	7,55	1421	4,86

Table 1: Mean values of the measured environmental factors in the sampling stations



### Aquatic macroinvertebrates and Ostracoda

We recorded a total number of 81 taxa, including 15 Ostracoda (Table 2), distributed in 6 phyla, 24 orders and 57 families. It is remarkable the finding of three endemic species: *Dugastella valentina*, *Palaemonetes zariquieyi* and *Melanopsis tricarinata*. One Aoridae amphipod, *Leptocheirus pilosus*, is here recorded for the first time in water bodies of the Valencian Community. Other rare species include the following: *Acroloxus lacustris*, *Plumatella* sp., *Ferrissia clessiniana*, *Echinogammarus pacaudi*, *Hydropsyche excollata*, *Gammarus aequicauda*, *Cyathura carinata*, *Lekanesphaera hookeri*, *Proasellus* sp. and *Heterotanais oerstedii* (see Figs. 2-8). Among ostracods, it is noticeable the presence of the exotic species *Fabaeformiscandona japonica*

Species	Poquet et al.	This study
<i>Cardinopoda kingi</i>	23	23
<i>Cardinopoda scouleri</i>	1	1
<i>Cyprina sp.</i>	54	3
<i>Cyprina boros</i>	355	3
<i>Cyprina vella</i>	4	16
<i>Dreissena stevenseni</i>	79	6
<i>Fabaeformiscandona japonica</i>		5
<i>Heterocypris salina</i>		5
<i>Hydropsyche gibba</i>	11	23
<i>Isocypris cf. brauchampii</i>		15
<i>Limnocythere inopina</i>		3
<i>Pseudocandona cf. albicans</i>		1
<i>Pseudocandona cf. maritima</i>		3
<i>Sarsicypris lazarocandona</i>		10
<i>Stenocypris major</i>		2
<b>Total n. spp.</b>	<b>6</b>	<b>15</b>

Table 2: Ostracod species found in Ullal de Baldoví during 2000<sup>1</sup> compared with the present survey

### Shannon diversity and the IMN (nutritional mode) index.

The faunal richness detected in "Ullal de Baldoví" is relatively high for such a small system. Shannon diversity values vary between 1.59 in Ba05 and 3.35 in Ba03. The variability of these values are mainly related to the heterogeneity of the sampling stations and their stability. Stations Ba05 and Ba06 are shallow and temporary, and highly affected by restoration works, what is probably affecting their present low frequency of particular taxa. The IMN index, which evaluate the proportions of different invertebrate nutritional modes<sup>(2)</sup> indicates that in Ba01, Ba04 and Ba05 the macroinvertebrate trophic web is simplified, indicating stressed conditions (Class IV). Stations Ba02, Ba03 and Ba06 show values representing a lowly diversified trophic web and stressed conditions (Class III). The most commonly found nutritional modes were the detritivorous (isopods and other groups), together with the omnivorous (decapods and amphipods) macroinvertebrates, while predators were very scarce (Fig. 9)

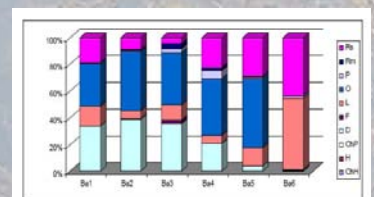


Fig. 9: Average frequency (%) of individuals of taxa belonging to different nutritional mode. CHP = herbivorous suckers; H = herbivorous ChP = predator suckers; D = detritivorous; F = filter feeders; L = limnivorous; O = omnivorous; P = predators; Rm = browsers; Rs = grazers.

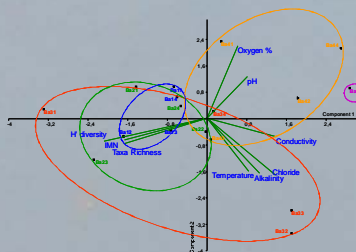


Fig. 10: Ordination of samples on the first two axes of a PCA biplot graph. Samples codes (BaXY) include sampling site as BaX and sampling season as Y. Sample groups are arranged as one ellipse per sampling station.

### Ordination of samples in relation to environment and macroinvertebrate results

Principal Component Analysis (Fig. 10) was carried out on the environmental data of samples, including abiotic variables and biotic data of taxa richness, diversity and IMN index. The results show how points Ba01-Ba03 have the highest macroinvertebrate diversity (both in terms of taxa and nutritional mode) and the lowest values of conductivity and oxygen concentration. Out of these points, the spring source (Ba01) is the less variable among seasons. Sampling sites analysed in the most transformed area for restoration (Ba04-Ba05) show lower biotic diversity and higher values of ionic concentration, temperature and oxygen saturation

## DISCUSSION AND CONCLUSIONS

Our results show the high variability of macroinvertebrate assemblages in the "Ullal de Baldoví" spring pool, including recently restored surrounding habitats. Three endemic macroinvertebrate species are living in the system, with high interest for conservation management. The findings of rare species such as the new record of the amphipod *Leptocheirus pilosus* or the exotic *F. japonica* calls for closer monitoring of this pond. The high abundance of organic matter, mainly related to reed leaves, is probably involved in the high incidence of omnivorous and detritivorous invertebrates. Highly transformed environments after restoration, mainly old rice fields converted to shallow ponds, are lowly diverse at present, but it is expected that their species richness and community complexity increases with time. Future monitoring will show if this expected trend is confirmed.

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